REMARKS

Claims 1 – 19 are now pending in the application. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 102

Claims 1, 2, 4 – 8, 10 – 15 and 17 – 19 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Boverle et al. (U.S. Pat. No. 5,349,932). This rejection is respectfully traversed.

Claim 1 includes calculating a desired air-per-cylinder (APC) based on a torque command, determining an effective throttle area corresponding to the desired APC based on a non-dimensionalized model and regulating a throttle based on the effective throttle area. Claim 7 includes a controller that calculates a desired air-per-cylinder (APC) based on a torque command, that determines an effective throttle area corresponding to the desired APC based on a non-dimensionalized model and that regulates the throttle based on said effective throttle area. The non-dimensionalized model provides an effective throttle area independent of ambient conditions (e.g., pressure, temperature) to accurately control engine torque output at any ambient condition.

The use of a non-dimensionalized model provides a normalized the model that eliminates the effects of ambient pressure and temperature. This enables a single model (e.g., APC = f(Area, RPM)) that is independent of ambient conditions. In this manner, the development of multiple models for varying ambient conditions is avoided,

which would increase cost and development time and would also increase the size of the model. In a de-normalizing process, the ambient conditions are used to compute the final throttle area.

Boverie et al. fails to teach or suggest calculating a desired air-per-cylinder (APC) based on a torque command, determining an effective throttle area corresponding to the desired APC based on a non-dimensionalized model and regulating a throttle based on the effective throttle area. Boverie et al. discloses a throttle-based control system that regulates the air-to-fuel (A/F) ratio of an engine based on an indicated set point (θ) of an accelerator pedal. More specifically, a set-point air charge (R_o) is determined based on θ and a reference air charge (R_r) is determined from a behavioral model of the engine based on R_c.

The behavioral model introduced by Boverie et al. includes the transient response of the air providing a more complex model than the present invention (i.e., APC = f(Area, RPM)), which is only concerned with steady-state operation. More specifically, the behavioral model introduced by Boverie et al. models the response of the APC to an APC command. The output of the behavioral model (R_c) is the reference air charge that is the control target. The model of Boverie et al. does not enable feed-forward control that determines the required throttle area to deliver the APC. Instead, Boverie et al. relys on feedback to determine the throttle area. More specifically, Boverie et al. uses linearization by return of state to adjust the throttle based on the air delivery error until the error goes to zero. In general, the behavioral model of Boverie et al. models the dynamic response of the APC for a given APC command, whereas the

non-dimensionalized model of the present invention models the relationship between APC and throttle area at steady state.

In view of the foregoing, Boverie et al. fails to teach or suggest determining an effective throttle area corresponding to the desired APC based on a non-dimensionalized model. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

With regard to claims 2, 4 – 6, 8 and 10 – 12, Applicants note that each ultimately depends from one of claims 1 and 7, which define over the prior art, as discussed in detail above. Therefore, for at least the reasons stated above with respect to claims 1 and 7, claims 2, 4 – 6, 8 and 10 – 12 also define over the prior art and reconsideration and withdrawal of the rejections are respectfully requested.

Claim 13 has been amended herein to include calculating a desired air-per-cylinder (APC) based on the torque command signal and determining a desired throttle area based on a non-dimensionalized model and the desired APC. Boverie et al. fails to teach or suggest calculating a desired air-per-cylinder (APC) based on the torque command signal and determining a desired throttle area based on a non-dimensionalized model and the desired APC.

As discussed in detail above, Boverie et al. discloses a throttle-based control system that regulates the air-to-fuel (A/F) ratio of an engine based on an indicated set point (θ) of an accelerator pedal. Although R_r is determined from a behavioral model of the engine based on R_c, Boverie et al. is silent as to the details of the behavioral model. Therefore, Boverie et al. fails to teach or suggest determining a desired throttle area

based on a non-dimensionalized model and the desired APC. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

With regard to claims 14 – 19 Applicants note that each ultimately depends from claim 13, which defines over the prior art, as discussed in detail above. Therefore, for at least the reasons stated above with respect to claim 13, claims 14 – 19 also define over the prior art and reconsideration and withdrawal of the rejections are respectfully requested.

Claims 1 – 19 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Southern et al. (U.S. Pat. No. 5,606,951). This rejection is respectfully traversed.

As discussed in detail above, each of claims 1, 7 and 13 include determining a throttle area based on a desired APC and a non-dimensionalized model. Southern et al. fails to teach or suggest determining a throttle area based on a desired APC and a non-dimensionalized model.

Southern et al. discloses a system for controlling the air supply to an engine. The system determines an initial coarse setting (S0) for the throttle position from a look-up table based on a pedal position and engine speed. The actual position of the throttle valve (12) is compared to S0 (i.e., desired setting) and is adjusted based on the difference or error therebetween (see Col. 6, Lines 23 – 39). Southern et al. does not determine a throttle area based on an APC and a non-dimensionalized model. Therefore, reconsideration and withdrawal of the rejection are respectfully requested.

With regard to claims 2 – 6, 8 – 12 and 14 – 19, Applicant notes that each ultimately depends from one of claims 1, 7 and 13, which define over the prior art, as discussed in detail above. Therefore, claims 2 – 6, 8 – 12 and 14 – 19 also define over

the prior art for at least the reasons discussed with respect to claims 1, 7 and 13. Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

REJECTION UNDER 35 U.S.C. § 103

Claims 3, 9 and 16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Boverie et al. (U.S. Pat. No. 5,349,932) in view of Southern et al. (U.S. Pat. No. 5,606,951). This rejection is respectfully traversed.

Each of claims 3, 9 and 16 ultimately depend from one of claims 1, 7 and 13, which define over the prior art, as discussed in detail above. Therefore, claims 3, 9 and 16 also define over the prior art for at least the reasons stated above with respect to claims 1, 7 and 13. Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (313) 665-4969.

Respectfully submitted,

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